

U.S. Serial No. 10/721,959  
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### AMENDMENTS TO THE CLAIMS

1. (Currently Amended) A method for demulsifying an emulsion comprising water and oil comprising the steps of:

(a) oscillatory mixing said emulsion to produce an oscillatory mixed emulsion wherein said oscillatory mixing is conducted at about a frequency corresponding to fracture frequency of the emulsion;

(b) separating said oscillatory mixed emulsion into an oil phase and a water phase; and

(c) recovering said oil and water phases.

2. Cancelled

3. (Currently Amended) A method for separation of a water-in-oil emulsion in a process scheme including an on-line oscillatory mixer comprising the steps of:

(a) collecting a water-in-oil emulsion from said process scheme;

(b) determining ~~the~~ elastic modulus of the emulsion as a function of frequency in the frequency range of 0.1 to 75 radians per second;

(c) determining ~~the~~ fracture frequencies of said emulsion from the said determination of the elastic modulus of the emulsion as a function of frequency;

(d) setting the said on-line oscillatory mixer to oscillate at a frequency corresponding to ~~any one of said~~ at least one determined fracture frequencies;

(e) oscillatory mixing said water-in-oil emulsion in said on-line oscillatory mixer set to said determined fracture frequency; and

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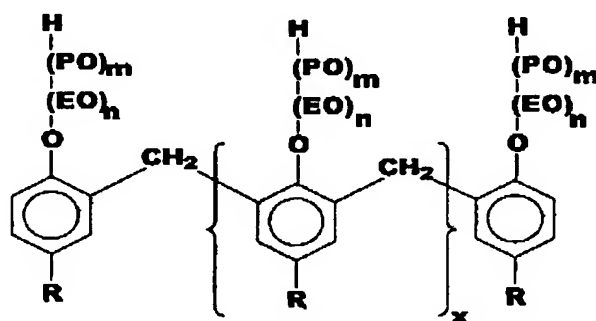
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(f) separating said mixed emulsion into a layer comprising water and a layer comprising oil.

4. (Original) The method of claim 1 further comprising adding chemical demulsifiers to said emulsion prior to or during said oscillatory mixing step (a).

5. (Original) The method of claim 4 wherein said chemical demulsifier is selected from chemical demulsifiers having a molecular weight of about 500 to about 5000 and a hydrophilic lipophilic balance of about 9 to about 35.

6. (Original) The method of claim 5 wherein said chemical demulsifier is a phenolformaldehyde ethoxylated alcohol having a formula:



wherein R is selected from the group consisting of alkanes, alkenes, or mixtures thereof from 8 to 20 carbons, E is  $\text{CH}_2\text{-CH}_2$  and P is  $\text{-CH}_2\text{-CH-CH}_3$ , n ranges from 1 to 5, m ranges from 0 to 5 and x ranges from 3 to 9.

7. (Original) The method of claim 4 wherein said chemical demulsifier comprises chemical demulsifier and about 35 wt% to about 75 wt% of a delivery solvent selected from the group consisting of crude oil distillates, alcohols, ethers or mixtures thereof.

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8. (Original) The method of claim 4 wherein the chemical demulsifier is present in an amount from 0.005 to 3.0 wt% based on the weight of emulsion.

9. (Original) The method of claim 1 wherein the oil of said emulsion is selected from crude oil, crude oil distillate, crude oil resid, vegetable oil, animal oil, synthetic oil and mixtures thereof.

10. (Original) The method of claim 1 wherein the method is conducted at a temperature of about 10 to about 100°C.

11. (Original) The method of claim 1 wherein said separation is accomplished by centrifugation, hydrocyclones, microwave, electrostatic field, gravity settling and combinations thereof.

12. (Original) The method of claim 11 wherein said centrifugation is conducted using a field which ranges from 500 to 150,000g for a time from 0.1 to 6 hours.

13. (Original) The method of claim 11 wherein said electrostatic field ranges from about 500 to about 5000 volts per inch for a time from 0.1 to 24 hours.

14. (Original) The method of claim 1 wherein said water of said emulsion contains dissolved inorganic salts of chloride, sulfates or carbonates of Group I and II elements of the long form of The Periodic Table of Elements.

15. (Original) The method of claim 1 wherein said emulsion contains solids.

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16. (Original) The method of claim 15 wherein said solids have an average total surface area of  $\leq 1500$  square microns.
17. (Original) The method of claim 1 wherein said oscillatory mixing is conducted at frequencies in the range of about 0.1 to 75 radians per second.
18. (Original) The method of claim 1 wherein said oscillatory mixing is conducted in continuous or pulse mode.
19. (Original) The method of claim 1 wherein said emulsion is a water-in-oil emulsion.
20. (Original) The method of claim 1 wherein said emulsion is an oil-in-water emulsion.
21. (Original) The method of claim 1 wherein said emulsion is a mixture of oil-in-water emulsion and water-in-oil emulsion.